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IPD Newsletter

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South Africa, Ukraine

COVER PHOTO: NRCS Soil Scientist **John Burns** (top left) coaches three visiting fellows from Haiti as they study a soil profile at the Tuskegee University Experimental Farm in Alabama, Jul. 21, 2016.

SEE ARTICLE ON PAGE 4. Photo by Joxelle Velázquez-García, USDA NRCS

The IPD Newsletter is a biannual publication produced by the International Programs Division of the Natural Resources Conservation Service (NRCS).

The document provides a six-month overview of NRCS participation in international activities, which included providing technical assistance and exchanging scientific and technical information.

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IPD Newsletter

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PAKISTAN

Water And Soils Projects Improve Agriculture



*NRCS Agronomist **Mike Kucera** (second from right) teaches soil infiltration during a soil health and fertility workshop, Dec. 8, 2016, in Islamabad, Pakistan. All students received a Soil Health Bucket with equipment and workbook to perform necessary tests, as part of the hands-on training experience.*

Photo courtesy of ICARDA

For several years, the U.S. and Pakistani governments, along with Pakistani and international organizations, have been cooperatively addressing various challenges across Pakistan's vital agricultural sector. Officials from the Natural Resources Conservation Service (NRCS), an agency of the U.S. Department of Agriculture (USDA), regularly participate in capacity building activities. These multi-year projects are managed by the USDA's Foreign Agricultural Service (FAS) and integrate the competencies of NRCS as part of a well-coordinated effort. Technical experts have provided guidance for the development of national policies on fertilizer use, trained farmers on soil quality and water harvesting, or conducted workshops to promote gender equality, to name a few.

NRCS Civil Engineer **Jon Fripp** and NRCS Agronomist **Mike Kucera** currently serve as key advisors for ongoing projects and returned to Pakistan for engagements, December 6-9, 2016. They were also joined by

FAS International Program Specialist **Hilary Landfried** who provides program oversight for the current activities.

An annual meeting occurred for the U.S.-Pakistan Water Dialogue: Diffusion and Adoption project, which is being implemented with the International Center for Agricultural Research in the Dry Areas (ICARDA).

Building on the success of three previous multi-year projects, the intention of the U.S.-Pakistan Water Dialogue is to identify simple and practical water management techniques for adoption in both rain fed and irrigated areas. Fripp, who serves as the NRCS Technical Lead for the project, reviewed with ten implementing partners the results of various activities conducted throughout the year. The day-long meeting entailed discussions over lessons learned, strategies to disseminate information to farmers, and establishment of work plans for 2017.



*NRCS Civil Engineer **Jon Fripp** (second from left) discusses water testing and treatment measures, Dec. 8, 2016. Participants learned how to test for pathogens and use a chlorination unit. Photo courtesy of ICARDA*

Fripp has developed an excellent reputation with ICARDA's partnering institutions, which greatly improves cooperation among the stakeholders. Not only does Fripp possess an impressive portfolio of international field experience and technical knowledge, but he has also been associated with all of the Pakistan activities since their launch in 2010. At the time, Fripp participated in the inaugural meeting of the U.S.-Afghanistan-Pakistan Trilateral Work Group to address watershed rehabilitation and water management concerns.

Kucera is the NRCS Technical Lead for ICARDA's U.S.-Pakistan Soil Health/Fertility project and participated in the respective annual meeting. During the engagement, Kucera was a key advisor in evaluating the effectiveness of the yearly activities conducted by ten of ICARDA's partnering institutions, as well as in providing guidance for future work plans. The project's goal is to improve soil fertility by educating farmers about soil health, soil fertility, and 4Rs of nutrient management. Likewise, government and industry stakeholders are also included so that policies and structures are

reformed to support science-based decision making. Pakistan has been cooperating closely with the Food and Agriculture Organization of the United Nations (FAO) and the USDA to update the country's 2001 fertilizer policy.

During the week, Kucera also led two soil health and fertility workshops at the National Agriculture Research Center. More than 30 soil scientists, agricultural service providers, and farmers participated in the field training. Kucera, who developed and taught the curriculum during previous trips, provided the students with a hands-on learning experience that explored the delicate relationship between soil health and nutrient management. In preparation for these workshops, the NRCS agronomist had introduced a refined training concept to Landfried at a West Virginia workshop for her familiarization.

Landfried, Kucera, and Fripp also participated in additional meetings with representatives from FAO, ICARDA, USAID, as well as the U.S. Embassy. The collaborative discussions are very important as they help build stronger support networks and shape country strategies. As preparations for the 2017 work plans and other capacity building activities progress, NRCS will remain engaged to provide technical assistance as outlined by USDA FAS. Fripp and Kucera are planning a 2017 workshop to train Pakistani counterparts on water treatment and water quality.

Jon Fripp, Mike Kucera, and Hilary Landfried contributed to this article.



*During a workshop, NRCS Agronomist **Mike Kucera** (second from right) introduces tools that will be used in the field to assess soil health and fertility, Dec. 8, 2016.*

Photo courtesy of ICARDA



HAITI

Fellowship Advances Haiti's Soil Science Capabilities

Fourteen soil conservationists from Haiti visited the United States for an intensive soil survey training course, July 11-29, 2016. The Natural Resources Conservation Service (NRCS), in collaboration with Auburn University and Tuskegee University, provided this training in Alabama as part of ongoing capacity building efforts. In 2014, NRCS scientists traveled to Haiti to assist the Ministry of Agriculture successfully design and conduct a pilot soil survey in the Cul-de-Sac region. The training in Alabama aimed at refining the skills of 10 ministry officials, as well as representatives from three other institutions. This opportunity was funded through the Cochran Fellowship Program of the U.S. Department of Agriculture's Foreign Agricultural Service.

NRCS Soil Scientist, then Acting National Leader for World Soil Resources **Charles Kome** has been coordinating the agency's Haiti Initiatives for several years. Following the 2010 earthquake, Kome and his supervisor, National Leader for World Soil Resources **Thomas Reinsch** (retired),

conducted a fact finding mission in 2011 to confirm, with Haitian officials, that soil survey remained a priority for developing science-based conservation plans to improve agricultural productivity, increase farmers' income, support sustainable land use, and the conservation of other limited natural resources.

In Haiti, high soil erosion intensifies the urgency of the Ministry of Agriculture to develop science-based strategies to protect, sustain, and efficiently manage soils. The significance of this non-renewable resource stretches far beyond agricultural production and food security—soils are also the foundation of ecosystems, play a key role in the carbon cycle, and influence planning of buildings and road construction, to name a few.

The island is also vulnerable to natural disasters, such as the earthquake in 2010 and Hurricane Matthew in 2016. Understanding soil properties and their ability to support infrastructure, for example linkages between soil moisture and landslide events, is critical to

*Visiting fellows from Haiti listen to NRCS Soil Scientist **Cooper Nichols** (in the soil pit) during soil survey training, Jul. 21, 2016, at the Tuskegee University Experimental Farm.*

Photo by Joxelle Velázquez-García, USDA NRCS

the country's progress and security.

The three-week training event aimed at empowering Haitian conservationists to develop a soil survey and soil information system tailored to their needs. NRCS Regional Director of Soil Survey Region 7 **Charles Love** (retired) was very pleased that his region was granted the opportunity to implement the training. Through extensive planning and coordination, NRCS partnered with Auburn University and Tuskegee University (soil science, agronomy, and GIS instructors) to develop and deliver a comprehensive course on how to map soils from start to finish.

"Both universities have long histories working in Haiti and have trained many Haitian scientists," said Kome. Additionally, the Soil Testing Laboratory (Auburn) and GIS Laboratory and experimental farms (Tuskegee) significantly enhanced the learning experience.

Fellows received classroom and field instruction on soil mapping, using traditional and digital techniques. NRCS Soil Scientist **Steve Depew**, referring to the 'Principles of Soil Correlation' segment he taught, noted: "A few of the main points we wanted to stress is that correlation is an ongoing process throughout the project." Accurate correlation of soils allows scientists, using a classification system and laboratory data, to interpret maps and make recommendations based on soil properties. "All team members play a role, and it helps to keep everyone on the same page by applying real world variability to establish standards or to help define new standards. Quality and consistency are key," continued Depew.

According to NRCS Soil Scientist **Ann Tan**, who led the 'Design and Characterization of Map Units' training: "Understanding what map units are is crucial to our soil survey framework." Aside from field documentation procedures and general information on scale or components, the availability of data from previous Haiti trips proved to be very beneficial. "Being able to explain to them why we cut out parts of the land into different soil map units was made easier by the fact that we had examples on landscapes they were familiar with," said Tan.

Field work took place at Tuskegee University, providing the Haitians the opportunity to study and classify a variety of soils. The fellows observed demonstrations from instructors and, in work groups of three, proceeded to describe soil profiles and collect field data. As part of a collective project, two teams were formed to conduct a soil survey of the training area. In the GIS laboratory, they applied concepts related to database systems,

mapping, using the ArcGIS software, and the principles of correlation introduced during previous classroom sessions. NRCS Soil Scientist **Cooper Nichols** explained: "The mapping project was put together to illustrate a real start-to-finish soil survey and the steps it takes to develop a soil map and its features."



*NRCS Soil Scientist **Martin Figueroa** (left) provides instruction on using geographic information systems for surveys, Jul. 12, 2016. Auburn University Graduate Research Assistant **Bley Cynthia N'Dede** (standing, center) supported the efforts.*

Photo by Joxelle Velázquez-García, USDA NRCS

After three weeks of intensive training, the Cochran Fellows (a mix of bachelor, masters, and doctoral graduates) thanked all of the partners that made this educational opportunity possible. They were very pleased with the content and delivery of the course, especially the field activities. Officials from the Ministry of Agriculture plan to use the new knowledge and skills to establish a soil survey program, continue soils and vegetation inventories, and eventually extend beyond the 2014 pilot area. Consequently, improved understanding of soils will contribute to sustainable management practices and informed decision making.

Kome appraised the overall engagement a success and appreciated the immense support of all involved, noting: "The Ministry of Agriculture placed their trust in us and we were glad that everybody—the Ministry, trainees, and FAS Cochran Program—was satisfied with the deliverables. Needless to say, without funding from the Cochran Program,

access to university resources, as well as the availability of NRCS staff, this training would not have been possible. Even the mayor of the city of Auburn, **Bill Ham Jr.**, visited the event to welcome the fellows and encourage them to make the best of this learning opportunity."

See additional training photos on page 6.

Charles Kome contributed to this article.

Additional Photos Of The Soil Survey Training For Haitian Scientists

All photos by Joxelle Velázquez-García, USDA NRCS



Haitian fellows listen to a translation as NRCS Soil Scientist **Alvin Perez** talks about project plans, Jul. 12, 2016. Almost all instructors worked with interpreters, hired by Auburn University, throughout the training.



Haiti Ministry of Agriculture Agronomist **Jean Leveill ** (blue shirt) discusses a soil profile, Jul. 21, 2016.



A soil profile, displaying the various layers or horizons, taken during the training, Jul. 21, 2016.



Fellows learn to classify soil by examining the texture to determine sand, silt, and clay percentages, Jul. 21, 2016.



NRCS Soil Scientist **John Burns** (second from right) reviews a map with Haitian scientists during a surveying exercise at the Tuskegee University Experimental Farm, Jul. 22, 2016.



NRCS Soil Scientist **Jessica Len ** (center) provides final guidance as the visiting Haitians prepare to head outside for training, Jul. 22, 2016.

MEXICO

NRCS Hosts Delegation To Promote The Science Of Conservation Planning



NRCS Area 1 Rangeland Management Specialist Alan Bower (right) discusses a soil probe sample during the field day exercise, Aug. 31, 2016.

Photo by Jonathan Groveman, USDA NRCS

Top agricultural experts from Mexico were treated to our comprehensive conservation planning course, completely translated into Spanish – a first for our Agency, from August 29 – September 2, 2016. Hosted by The Nature Conservancy at their Staten Island reserve near Stockton, the group of 11 delegates from Mexico and 11 NRCS staff members went through the entire 5-day classroom and field instructions, incorporating topics like soil health, wildlife habitat and water conservation.

“This training was a great opportunity to assist leaders from Mexico to provide a foundation for technical work in agricultural conservation,” said **Tom Hedt**, NRCS State Resource Conservationist and a course team member. “Our hope was to convey to these visitors that the conservation planning process is so important because we, as

conservationists, learn the most during our meeting with farmers on their property, which can’t be replicated by just talking over the phone. You really need to visit the property, walk around, and hear directly from the landowner about their issues.”

The field day, August 31, was primarily led by the land manager at Staten Island. He discussed a number of topics relative to farming in California’s Delta region. Unique concerns included subsidence, levee management, irrigation fish screens, and habitat management for the Sandhill Crane and various other species.

“Our goal is to take the methodologies and strategies used by NRCS in California, that are applied to the soil, water, air, plants and animals, and help our agribusinesses be more sustainable in Mexico,” said **Octavio Avilez**, Regional Director for FIRCO.

The delegation included agronomists, agricultural engineers, economists, rural sociologists and other professionals from the Fideicomiso De Riesgo Compartido (FIRCO), a division of Mexico’s Secretary of Agriculture, Livestock, Rural Development, Fisheries and Food. Attendees represent different states within Mexico and bring farming perspectives from their various regions.

NRCS has an ongoing professional partnership with FIRCO to promote an educational exchange about on-farm conservation. FIRCO representatives in Mexico hosted a group of NRCS California leadership in 2014. In turn, this FIRCO delegation is participating in NRCS’s conservation planning course to replicate some of these new skills in Mexico.

Article written by Jonathan Groveman, USDA NRCS.



NRCS visited a state run organopónico—organic raised bed operation—on Dec. 15, 2016. Throughout the Havana Province, more than 80 organopónicos, not all state run, are just a fraction of an elaborate network of organic and urban operations that produce a variety of vegetable crops for the Cuban population. Photo courtesy of USDA NRCS

CUBA

Interview: NRCS Historic Visit To Cuba Explores Soils, Irrigation, And More

Reflecting on observations made during travel, an American soil conservationist noted: “Probably in no other country of the world has soil character had stronger influence upon national welfare than in Cuba. The wealth of the island has been derived directly and almost wholly from its varied soils.”

After considering several factors of agricultural production, such as soil quality, crop selection, and fertilizer use, he concludes, “...the possibility of establishing for Cuba a new economic equilibrium based upon an improved type of agriculture constitutes one of the most attractive and important scientific problems to be found anywhere in the field of agricultural development today.”

These were not recent statements, but instead made in 1928 by Hugh Hammond Bennett, in his article “Some Geographic Aspects of Cuban Soils.” Bennett and fellow researcher Robert Allison performed soil and agricultural surveys in Cuba in 1925 and 1926. Just a few years later, in 1935, Bennett would be named the first Chief of the newly established Soil Conservation Service—later renamed as the Natural Resources Conservation Service (NRCS).

Nearly 90 years after Bennett’s trip to the island nation, three NRCS scientists had the opportunity to participate in the agency’s inaugural information exchange with the Cuban Ministry of Agriculture.

The NRCS team, consisting of Conservation Agronomist **Linda Scheffe**, Civil Engineer **Chayla Rowley**, and Agricultural Engineer **John Tiedeman**, traveled to Havana, Cuba, December 11-17, 2016. During the week, they met with government officials and scientists, as well as visited farms to observe agricultural practices. Of particular interest were the Cuban’s advancements in urban and organic agriculture.

The NRCS International Programs Division (IPD) interviewed the team upon their return. How would their observations compare to those made by the “father of soil conservation?”

IPD: When NRCS received the opportunity to participate in this information exchange, what were you most curious about to explore first-hand?

Tiedeman: The advances in urban agriculture, such as how they could produce a high percentage of produce for Havana within the city limits. Also, how farmers were incentivized to be productive under a socialist economy.

Rowley: I was most interested in seeing how the historic events would influence the social and cultural impacts we would experience during our trip, and if that would create any barriers to our exchange. Also, would the difficulties in obtaining materials result in low-tech solutions to agricultural practices or would those lack of resources result in a poorer quality of service and operation in the conservation of their natural resources?

Scheffe: I was most curious to see first-hand their urban and organic agriculture and how sustainability is viewed and achieved. How they have been able to develop their biofertilizers and biopesticides is quite a lesson for all countries.

IPD: Often, NRCS can rely on interpreters in foreign countries, but for this trip we needed a team that was fluent in Spanish. Aside from your language skills, what other experiences gave you confidence in performing this information exchange?

Scheffe: We had all lived and worked in other countries trying to assist in building sustainable systems, so we came to the table with our sleeves rolled up, eager to listen and learn, with a smile on

our face and our passion for conservation emanating. We also possessed small farm experience overseas and in the USA, so we were able to discuss sustainability from a practical local sense, as well as from a national sense—farmer to farmer and specialist to specialist.

Tiedeman: Aside from technical knowledge, two of the most important skills are communication and cultural sensitivity. If we demonstrate genuine interest and appreciation for the country and culture, we set the stage for meaningful exchange and mutual effort. At home or abroad, if we don't engage people, their dreams, their motivations, we miss connecting with them.

Rowley: I was fortunate to be born and raised abroad in a few different countries, so navigating new cultures is almost my definition of home. Also, my research project for my engineering degree helped prepare me as well. I was working in Guatemala on small-scale greywater systems and it entailed me using Spanish daily to visit with families. This prepared me not only linguistically and technically, but it also served as a reminder that often you must be willing to spend a lot of time in discussion before jumping into the technologies at hand. This experience was invaluable when it came to interacting with the Cuban officials and the local producers,

since a large focus of the exchange was to develop relationships between our two countries.

IPD: Bennett had advocated in the 1920s for Cuba to diversify crop production, many years before consequential Soviet-Cuban trade relations. Following those experiences, how much diversification is now taking place?

Scheffe: There is definitely a great amount of diversification taking place, at least in the Havana Province. We discussed mostly small farms and not high profit cash crops.

Rowley: We saw and heard about a wide variety of crops grown across the country—anything from coffee and cacao to sweet potatoes and rice.

Tiedeman: It seems production is focused primarily on food security, but also diversification to meet domestic demand. We heard a little about subsidized rations of staples available at low-cost from government stores.



The NRCS Team met with officials at Cuba's Ministry of Agriculture, Dec. 12, 2016, to share general information and discuss the activities for the week. Photo courtesy of USDA NRCS



“The Cubans have placed much importance on biodiversity, biofertilizers, biopesticides, and using locally available resources. The soils appeared to be of a good quality in the urban environments we observed.”

**Linda Scheffe, Conservation Agronomist
NRCS National Soil Survey Center, Lincoln, NE**

IPD: Geopolitics significantly influenced Cuban agriculture, taking the focus from small-scale farming to large-scale monoculture farming, and eventually returning to small-scale farming. What is the government’s approach to minimize food shortages?

Rowley: Our Cuban counterparts were quick to tell us they didn’t want to rely on any one country to help them fill in gaps or any one food source or farming technique. Diversification was a big piece of their answer including diversification of crops, levels of privatization, and international partners.

Tiedeman: Increased privatization, with different forms of land tenure, such that farmers have greater autonomy and reap the profits of what they produce. This is also occurring with cottage industries, such as small scale services and retailing.

Scheffe: It appears there is infrastructure and human resources to facilitate the

integration of research, innovation and technology transfer, and technical scientific service from the national level through the provincial to the municipal and then to the field level. It is evident that Cuba has put an extreme emphasis on soil microbiology and the production and use of biofertilizers.

IPD: You met with officials at the Soils Institute. Have they adopted a similar approach to soil conservation as is advocated by NRCS in the USA?

Scheffe: They were very impressed by the model approach which NRCS has of soil survey combined with conservation planning of natural resources. The Cuban’s soil survey is not as detailed as that of the USA and they are interested in Web Soil Survey. They also have a type of agricultural extension network, as well as research laboratories, but they were impressed at the idea of having local field offices as NRCS does. The conservation planning

of NRCS is a locally led approach with interdisciplinary teams working directly with farmers.

IPD: How are Cubans approaching irrigation and where do you see current limitations?

Tiedeman: Unfortunately, we only received a limited snapshot. However, the Cuban engineers and extension personnel seem to have a good grasp of the fundamentals of irrigation and soil conservation. My sense was that certain areas of technology, such as surveying, land grading, and coastal salinity control may be lacking. We did not see or hear much about these technologies during our visit, but the Cubans expressed interest.

***LEFT:** Companion planting used on a Cuban farm; lettuce and cabbage cultivation.*

***RIGHT:** A plant nursery on a state run farm.*

Photos courtesy of USDA NRCS



IPD: How efficient were the water distribution systems on the farms visited?

Rowley: Most of the distribution systems we saw were on the less technologically advanced side. As an example, one landowner relied on rainwater and a portable pump he would hook up to different pipelines he would put together on the spot, depending on where he wanted to take the water on his farm—very inefficient and time consuming. We also visited an operation which only relied on rainwater, so had no distribution system, and an operation with a full irrigation system including fertigation. This definitely instills in me that we just scratched the surface on the distribution systems they use and their effectiveness for their applications.

extensively in Cuba. In the case of cassava and sweet potato, in addition to nitrogen fixation, the active substances synthesized by this bacteria stimulate photosynthesis and reduce respiration of the crop. Good results have been obtained in Cuba when citrus trees, coffee, passion fruit, mango, pineapple, and tobacco seeds were inoculated with mycorrhizal fungi.

IPD: Is large-scale mechanized agriculture something Cuban officials are exploring to improve food security?

Tiedeman: Production of staple crops, such as rice, root crops, and sugar cane, should be on a larger scale to feed the population. Mechanized agriculture has an important role

in improving efficiencies. For example, use of tractors for land preparation, grading, seeding, tillage, and harvesting. At the same time, for economic stability and employment, officials are also supporting smaller scale production using animal traction. Crop yields are important, but so is productive employment and subsistence farming.

Scheffe: Cuba is still pursuing export crop production, like sugarcane, tobacco, and citrus. Their organic market is also growing. However, we learned that they want to improve rice production on a larger scale.

Rowley: I got the feeling that it was a bit of an internal struggle. They want to increase production on the staples for the Cubans' diets and to bring in more money



“Cuban officials are exploring land-leveling. They seem to understand that surface irrigation, especially rice, depends on well graded fields to accomplish uniform water applications and improve yields. Rice is grown in standing water for weed suppression, and uniform depths are important. As seen in Asia, as well as California where I live and work, rice can be grown on level terraces, but it requires surveying and design.”

**John Tiedeman, Agricultural Engineer
NRCS California, Redding, CA**

IPD: Biofertilizers are an important aspect of Cuba's organic farming. What were you able to observe?

Scheffe: Cuba has made great advances in developing and using naturally occurring microorganisms for agricultural purposes for many years. For example, Cuba has national strain selection and production programs for Rhizobia inoculation of legume seeds. Commercial preparations based on the free-living, nitrogen-fixing *Azotobacter chroococcum* bacteria have also been used

FROM LEFT TO RIGHT: An example of an irrigation system on a Cuban farm; consisting of an engine-driven portable pump, PVC and polyethylene pipe, and above ground sprinklers Photos courtesy of USDA NRCS





“There was some discussion on rainwater harvesting to help the Cubans spread out their wealth of rainfall. They shared while they do have high rainfall, they often receive most of it over the course of a day or just a few hours and then no more rain for extended periods of time. Related to runoff, they used contouring and diversion ditches to address water related erosion on local farms.”

Chayla Rowley, Civil Engineer
NRCS Colorado, Steamboat Springs, CO

from increased cash crop exports. At the same time, they don't want to stray too far into large operations which gain more wealth than others working just as hard on smaller operations. Equity is very important there, and equity is determined by sweat and dedication, not by scale.

IPD: Hurricane Matthew passed through the region two months before your trip. What impression did you have regarding resiliency and disaster preparedness?

Rowley: I didn't see anything first hand, but the Cubans did say their cacao crops were affected by Hurricane Matthew, however I am uncertain of the extents.

Scheffe: Officials mentioned they want to improve their disaster preparedness and resilience to drought and climatic factors. Also, their cropping diversity will for sure be one way to improve food security.

Tiedeman: We heard very little about Hurricane Matthew, although damages were significant in the eastern provinces.

IPD: Throughout the Soviet era, Cuba would, despite numerous inefficiencies, produce large volumes of sugar cane in exchange for food crops. From what you saw, how efficient is the cane production today and what priority does it have?

Tiedeman: We saw sugar cane fields on our day visit to the west end of the island. However, we didn't have the opportunity to visit a sugar cane operation.

Scheffe: From talking to the Ministry of Agriculture, there is still a priority in order to export to various countries and also for their own use. But clearly they are now growing more and more of their own food crops.

Rowley: I do remember that our Cuban counterparts mentioned they have yet to return to the level of sugar cane production they were at in the early- to mid-1900s, but I cannot speak to their efficiency.

***FROM LEFT TO RIGHT:** Conservation practices seemed well understood at sites visited. The team observed terraces with rock barriers (left) and king grass (right), composting, vermiculture, and biofertilizers, to name a few. Photos courtesy of USDA NRCS*





TOP: Greenhouses and field production at a more intensive farming operation.

RIGHT: Drip irrigation.

FAR RIGHT: A greenhouse system observed during the visit. There are more than 200 greenhouses in the Havana Province.

Photos courtesy of USDA NRCS

IPD: What lessons can American farmers, perhaps American urban farmers, learn from Cuba's approach?

Tiedeman: We can't know when a disaster—natural, political, or other—might require a return to traditional farming methods, as happened in Cuba. Adages from traditional farming and earlier generations generally have a solid foundation in science. So, don't lose sight of them.

Rowley: Something I found interesting is Cuba's ability to incorporate organic farming in urban settings. I think it would be worth looking into their city zoning, organic farming laws, and systems they have in place to source agricultural inputs from nearby.

Scheffe: American families should try to have a garden or be part of a community garden. Also, there are opportunities to utilize local resources and share practices that work with each other.

IPD: Is there a particular observation or incident you want to recall?

Scheffe: The Cuban people are such a sharing and social culture that I could see how they were able to achieve what they have in sustainable agriculture. Also, the fact that they did not have computers or internet for so many years may have been to their advantage in the way that they read books, studied and worked with each other in the field to develop solutions to the sustainability issues.

Tiedeman: The commitment and ability to keep older equipment running is worthy of respect. Think of the 1950's American cars still driving around Havana. We observed a variety of equipment on the small number of Cuban farms visited. These ranged from old creek pumps kept running with mechanical know-how and baling wire, to a pre-1990 Soviet built pump station, to modern fertigation and greenhouse drip systems.

Rowley: I was also impressed to see a true mix of genders, ethnic backgrounds, skin tones, and

ages across all levels of government and in roles of varying education levels. As a young female on the team, I felt sufficiently respected and appreciated for my insights. They seemed intent on making sure everyone had a chance to share their thoughts.

IPD: After briefly visiting Cuba, despite being confined to the Havana Province, how would you compare your observations to those made by Bennett more than 90 years ago?

Scheffe: Referring to the monoculture of sugarcane production, Bennett recommended that Cuba place more importance on diversity of cropping systems and also on judicious use of chemical fertilizers. In the last years, Cuba has diversified their cropping systems and even went beyond just judicious use of chemical fertilizers; they have advanced quite a bit in the use of organic amendments and biofertilizers.

Tiedeman: Our limited introduction to Cuban soils tend to confirm Mr. Bennett's



ABOVE: Cuban sweet potatoes.



*RIGHT AND FAR RIGHT:
Cuban papayas and tobacco.*



Photos courtesy of USDA NRCS

observations. Prior to development of sugar plantations, early in Cuba's development, much of the island was covered by rain forests and rich soils. Forest clearing and intense cultivation led to soil degradation and loss of natural productivity. Beginning in 1960, and particularly since 1990, focus has returned to sustainable soil conservation, with particular emphasis on soil biology. It would be fair to say the Cuban emphasis on biological soil management was borne out of necessity. They have risen to the challenge, and

are now contributing beneficial knowledge to other countries, as well as their own.

Rowley: I would say I agree about the soils being so varied that they provide the Cubans a great many opportunities within agriculture. The wide array of crops alone is fascinating to see in a country of its size. However, I might veer away in my thinking compared to Bennett's view of soil character having the strongest influence on national welfare in Cuba than in any other country. It

seems to me that societal cooperation and human resiliency are perhaps stronger influences on a country's national welfare. In fact, if I felt so inclined, those are the terms I would probably use to rephrase it, "Probably in no other country of the world have societal cooperation and human resiliency had stronger influence upon national welfare than in Cuba."

IPD conducted interviews in March and April 2017.

OTHER ACTIVITIES

Belgium

NRCS Research Soil Scientist **Moustafa Elrashidi** attended the 18th International Conference on Heavy Metals in the Environment, September 12-15, 2016. The 4-day meeting was held at the University of Ghent and attracted approximately 300 scientists, primarily from Europe. Lectures and parallel sessions focused on scientific developments and experiences, such as soil and water contamination and environmental impacts caused by metals.

Burma

The U.S. Army Pacific requested NRCS Civil Engineer **Timothy Brasuell** to serve as the agricultural expert during a multinational disaster response exercise, which took place in Naypyitaw, December 6-9, 2016. More than 140 participants from Cambodia, Laos, Myanmar, Thailand, Vietnam, and the U.S. gathered for table-top exercises and presentations related to flooding disasters in the Lower Mekong Basin. Subject matter experts explored flood event impacts, responses, as well as pre-disaster planning approaches

across various disciplines, such as civil-military relations, public health, transportation, and communications. Brasuell worked with participants to develop best practices to increase resiliency of agricultural landscapes, introduced the NRCS nine-step conservation planning process, and facilitated discussions to address various scenarios caused by overtopping dams and subsequent flooding. The Disaster Response Exercise & Exchange is an annual engagement that is co-organized by U.S. Army Pacific and a member of the six-country Lower Mekong Initiative; the 2017 iteration will be held in Vietnam.

Canada

The 10th International Rangeland Congress took place July 16-22, 2016, in Saskatoon, Saskatchewan. NRCS Rangeland Management Specialists **Sid Brantly** and **Gene Fults**, as well as Rangeland Hydrologist **Kenneth Spaeth** attended the professional gathering that attracted scientists from across the world. This year's theme was "The Future Management of Grazing and Wild Lands in a High-Tech World." Throughout the week, technical information was presented during plenary and concurrent oral sessions, field experiences shared at networking opportunities, and a large variety of posters were on display to further expand on individual themes. Additionally, the NRCS researchers hosted a pre-congress workshop on rangeland soil health. The half-day event provided 25 participants the opportunity to learn, review, and discuss five evaluation tools or assessment concepts.

NRCS Soil Health Specialist **Jay Fuhrer** traveled to Alberta, Canada, to conduct workshops for farmers and ranchers, August 16-18, 2016. Fuhrer provided training at two workshops, raising awareness among more than 100 participants about soil health principles, the carbon cycle, and planning a cover crop strategy. One of the participants from the Peace Country Beef & Forage Association expressed their appreciation, posting to their Facebook page: "Thanks Jay for helping us put the Soil Health 'puzzle pieces' together!"

NRCS Regional Ecologist **Elizabeth Powers** and Soil Survey Leader **Nathan Parry** participated in the Northwest Boreal Monitoring System Workshop, in Whitehorse, Yukon,

October 18-20, 2016. U.S. and Canadian conservationists of the Northwest Boreal Landscape Conservation Cooperative continued their collaboration to develop standards for monitoring and responding to natural and human-induced changes across sensitive and shared ecosystems; spanning Alaska, Yukon, Northwest Territories, and British Columbia. Vegetation composition, soil moisture, permafrost, stored carbon, and invasive species were some of the proposed attributes and the 31 technical experts established definitions and discussed standards for data collection to facilitate sharing of information among stakeholders.

Representatives from Agriculture and Agri-Food Canada returned to Washington, D.C., to participate in a workshop planning meeting with the U.S. Department of Agriculture, November 1, 2016. USDA participating agencies included the Agricultural Research Service, National Institute of Food and Agriculture, and NRCS. The purpose of this meeting was to identify respective priorities and determine how outcomes from a binational workshop could be implemented. NRCS participants included International Programs Director **Lillian Woods Shawver**, then Acting National Leader World Soil Resources **Jessica Lené**, Soil Science Division Director **David Lindbo**, and Resource Assessment Division Director **Daniel Mullarkey**.

China

NRCS hosted a delegation from the Rural Environment and Energy Agency of the Chinese Ministry of Agriculture, September 19, 2016. During the day-long visit, a series of presentations were made by NRCS subject matter experts to inform the 19 Chinese officials

about a variety of topics. The individual presentation titles were "Web Soil Survey and Potential Applications with Precision Farming," "NRCS Watershed Projects for Emergency Disaster Recovery," "Irrigation and Waste Water Management," and "Anaerobic Digesters and Manure Gasifiers." Additionally, a representative from Rural Development spoke about the "Rural Energy for America Program." This delegation visit was part of a research program that was coordinated with George Mason University. The NRCS experts that presented during this event were National Leader for Soil Interpretation **Maxine Levin**, National Watershed Programs Team Leader **Kevin Farmer**, National Water Management Engineer **Rob Sampson**, National Environmental Engineer **Bill Reck**, and National Leader Animal Husbandry **Glenn Carpenter**. Energy Program Specialist **Frederick Petok** of Rural Development presented as well.

On October 11, 2016, NRCS National Conservation Innovation Grants (CIG) Program Manager **Mike Bennett** and CIG Program Analyst **Melleny Cotton** met with six Chinese officials. During the meeting, the foreign officials learned about the federal grants cycle and awards process, as well as how CIG facilitates the adoption of new technologies.

NRCS National Agronomist **Norman Widman** and National Nutrient Management Specialist **Dana Ashford-Kornburger** shared information about precision agriculture with a Chinese delegation, November 21, 2016. The seven-person group was particularly interested in learning how advanced agricultural technologies are promoted.

On 29 November, 2016, NRCS hosted four Chinese representatives in California. The engagement included discussions on the disposal of farmland nutrients and livestock waste, agricultural nonpoint source pollution, ditch monitoring, and agricultural emission permits. NRCS also facilitated visits to the Natural Resources Defense Council, the Environmental Protection Agency, and a farm visit. This international engagement was supported by State Conservation Engineer **Luis Laracuente**, State Soil Scientist **Tony Rolfes**, Civil Engineer **Dan Toan**, Yolo County District Conservationist **Phil Hogan**, and Assistant State Conservationist **Alan Forkey**.

France

More than 125 technical experts and policymakers from numerous countries attended the 2nd Global Soil Security Conference, December 5-6, 2016, in Paris. NRCS National Leader for Technical Soil Services **Michael Robotham** represented the agency at the event and held two presentations: “Haiti Soil Survey and Natural Resources Conservation” and “Healthy Soil Systems – a Soil Survey Approach to Soil Security.” Additionally, Robotham served on the discussion panel that explored “Further steps to achieve Soil Security,” as part of the conference’s concluding activity.

Germany

NRCS National Leader for Soil Survey Standards **Curtis Monger** traveled to Berlin to engage with approximately 30 scientists, October 10-14, 2016. During the International Standards Workshop, Monger and fellow experts collaborated to explore prospects for soil survey

standards that are internationally recognized; improving sharing of data and interoperability.

Kazakhstan

Three technical experts of the U.S. Department of Agriculture served as workshop instructors and provided training on rangeland technology tools, December 13-16, 2016, at the National Agrarian University in Almati, Kazakhstan. NRCS Rangeland Hydrologist **Kenneth Spaeth** provided students with information about ecological site descriptions, monitoring protocols, and indicators of rangeland health. Additional instruction was provided by Research Leader and Range Hydrologist **Mark Weltz** and Information Technology Specialist **Jason Nesbit** of the Agricultural Research Service’s Great Basin Rangelands Research Unit. Weltz and Nesbit introduced the Rangeland Hydrology and Erosion Model, which can assist with assessing conservation efforts. More than 50 scientists, from government and non-government organizations, universities, and private sector companies, participated in the workshop.

Pakistan

On September 13, 2016, the U.S. Department of Agriculture’s Pakistan Team was collectively recognized with the Abraham Lincoln Honor Award. NRCS Civil Engineer **Jon Fripp** and NRCS Agronomist **Mike Kucera** were among the group to receive the department’s most prestigious award. For several years, NRCS technical experts—as members of the Pakistan Team—contributed to capacity building efforts to improve the country’s agricultural sector. During multiple trips, agency employees provided Pakistani officials with guidance,

for example on updating national fertilizer policy or improving watershed management. Other activities focused on workshops that provided valuable hands-on training on soil and water conservation principles.

South Africa

The 5th International Soil Classification Congress took place December 1-7, 2016, in Johannesburg. NRCS National Leader for Soil Survey Standards **Curtis Monger** participated in the full event, which included a 4-day field workshop and a 3-day conference. Monger gave a presentation on international soil horizon nomenclature.

Ukraine

Six Ukrainian officials visited with NRCS National Agronomist **Norman Widman**, October 31, 2016. Widman was asked to share information on alternatives to crop residue burning, such as direct seeding technologies.